

Appl. No. 10/529,780
Reply to Office Action mailed May 2, 2007

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R E M A R K S

The specification was amended hereinabove to correct minor clerical errors.

Claim 8 was amended to include features from claim 17 (see the first paragraph of page 9 of the specification), claim 20 (see the bottom of page 9 of the specification) and page 12, lines 21 to 25 of the specification.

New claims 22 to 26 recite the features of claims 2 to 6, respectively.

New claim 27 recites the features of claim 21.

With respect of Rule 116, entry of the claim amendments and new claims is respectfully requested, since most of the claim amendments and all of the new claims involve features that were set forth in the claims prior to the final rejection. Moreover, in view of the above cancellation of claims, the number of pending claims has not been increased.

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Claims 1 to 21 were rejected under 35 USC 103 as being unpatentable over USP 5,290,905 to Komiya et al. in view of USP 6,191,212 to Kube and USP 5,288,839 to Greco and further in view of USP 6,821,110 to Carlson et al. for the reasons set forth in item nos. 1 to 5 on pages 2 to 4 and item nos. 6 to 11 on pages 4 to 6 of the May 2, 2007 Office Action.

It was admitted in the May 2, 2007 Office Action that Komiya et al. are silent in specifying the adhesive is a hot melt adhesive and the polyester polyol mixture contains both crystalline and amorphous compounds.

It was also admitted in the May 2, 2007 Office Action that Greco is silent regarding the amounts of the polyester polyol and possible substrates.

It was further admitted in the May 2, 2007 Office Action that Kube does not teach a polycarbonate polyol.

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Moreover, it was admitted in the May 2, 2007 Office Action that Komiya et al., Kube and Greco are silent in teaching a metal substrate.

The present claims are directed to a reactive hot melt composition obtained by reacting

(i) a polyol mixture comprising

(1) 30 to 90% by weight of a crystalline polyester polyol having a number average molecular weight of 1,500 to 10,000, produced from at least one aliphatic dicarboxylic acid and a first aliphatic diol as main components,

(2) 5 to 30% by weight of a polyester polyol having a number average molecular weight of 1,500 to 10,000, produced from at least one aromatic polycarboxylic acid and a second aliphatic polyol as main components, and

(3) 5 to 40% by weight of a polycarbonate polyol having a number average molecular weight of 500 to 5,000,
and

(ii) a polyisocyanate,

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wherein a molar ratio of the OH group of the polyol mixture to the NCO group of the polyisocyanate is 1:1.7 to 1:2.5.

The present claims are thus directed to a reactive hot melt composition (prepolymers) and a molded product prepared from the reactive hot melt composition. In the present claim 8, a number average molecular weight of the polyester polyols of (1) and (2); a number average molecular weight of the polycarbonate polyol; and a molar ratio of the OH group of the polyol mixture to the NCO group of the polyisocyanate are set forth. A hot melt composition having such features clearly shows that the composition is a prepolymer for the reasons explained below.

Komiya et al. disclose a polyurethane which has already been polymerized and disclose the use of the thus polymerized polyurethane as an adhesive (column 8, lines 52 to 57 of Komiya et al.). In other words, Komiya et al. propose heating the polymerized polymer at a temperature above the melting point and using it in a melted form as an adhesive.

On the other hand, Greco discloses the use of prepolymers in a reactive adhesive (column 1, lines 2 to 3 of Greco); and

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discloses that an amorphous polyester mixed with a crystalline type reduces shrinkage in the crystalline phase and can increase the initial tack before cross-linking (column 1, lines 48 to 50 and 53 to 56 of Greco).

Generally in the field of polyurethanes, for the preparation of a polymer, two methods are available: one in which only monomers are polymerized at a time; and the other in which short prepolymers are first prepared and then polymerized. If a diol and an isocyanate are reacted in the ratio of 1: 1.2 or more, a short polymer having isocyanate groups at the both ends will be obtained, and such a short* polymer is called a prepolymer. Theoretically, if a diol and an isocyanate are mixed in the ratio of 1:1, one long polyurethane chain will be obtained. However, if an isocyanate is mixed in a larger amount than that of diol, the diol will be finally consumed and the reaction will terminate with the both ends being an isocyanate.

Komiya et al. exemplify the use of a thermoplastic resin as an adhesive by dissolving it by heat before use, whereas Greco

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and Kube propose that a raw material, i.e., prepolymers, are applied and then polymerized to produce an adhesive effect.

In Komiya et al., the polymerized polymer has a higher average molecular weight than the prepolymers recited in applicants' claims (as discussed hereinbelow, the polymers in the Examples of Komiya et al. have an average molecular weight of approximately 29451, whereas the prepolymers in the Examples in the present specification have an average molecular weight of approximately 4426). The viscosity of a polymer is affected by the molecular weight of the polymer. Namely, with respect to the Komiya et al. polymer, even if a crystalline polyester polyol and a non-crystalline polyester polyol are mixed and polymerized, there will be no change in the viscosity resulting from the presence of the non-crystalline polyester polyol. Further, if the melting viscosity is increased by using a non-crystalline polyester polyol, the viscosity of the melted polymer which has already been very high will be further increased, resulting in difficulties in molding or in the use as an adhesive.

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Therefore, it is respectfully submitted that Greco's disclosure cannot be applied to the Komiya et al. adhesive, and there is no motivation for using a crystalline polyester polyol and an amorphous polyester polyol as disclosed in Greco and Kube as a prepolymer adhesive in combination with the polymer adhesive as disclosed in Komiya et al.

As discussed above, the hot melt composition of applicants' present claims is a prepolymer, whereas the composition in Komiya et al. is a polymer and not a prepolymer. Applicants have informed the undersigned that the molecular weight of the prepolymer of applicants' present claims can be calculated to be 973 to 10812. Further, the molecular weight of the prepolymers as prepared in Examples 1 to 8 of the present specification can be calculated as shown in the following table.

Example No.	Molecular weight
1	4288
2	4814
3	4854
4	4834
5	3825
6	4207
7	4447
8	4137
Average	4426

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On the other hand, in the Komiya et al. polymer, the ratio of diol (polymer diol + chain extender) to diisocyanate is 3:3.05 to 3:3.15 (1:1.017 to 1:1.05) as shown in Table 3 in columns 13 to 14 of Komiya et al. Based on this ratio, the molecular weight of the polymers as prepared in the examples of Komiya et al. can be calculated as shown in the following table.

Komiya et al. Example No.	Molecular weight
1	16457
2	16490
3	17390
4	48671
5	57032
6	57032
7	20509
8	23842
9	24259
10	21272
11	19804
12	18222
13	61182
14	19790
15	19817
Average	29451

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The above results show that there is a great difference in the molecular weight between the prepolymer of applicants' present claims and the polymer of Komiya et al., and also show that there is no motivation for combining Komiya et al., which disclose a polymer (not a prepolymer), with Greco or Kube, which disclose a prepolymer.

It is therefore respectfully submitted that applicants' claims are not rendered obvious over the references, either singly or combined in the manner relied upon in the Office Action in view of the many distinctions discussed hereinabove. Withdrawal of the 35 USC 103 rejection is thus respectfully requested.

Reconsideration is requested. Allowance is solicited.

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If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below.

Respectfully submitted,



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